case of monarchs, traditional wintering sites in California and Mexico have been converted by development, deforestation, or agriculture. Thus, tens of millions of monarchs are restricted to 10 sites in Mexico (5 of them unprotected by regulations) and only 7 remaining sites in California. The butterflies are not yet endangered, but a major part of their life cycle is in jeopardy.

Outreach in elementary schools has improved the public's appreciation of bats. And BCI is working with mining companies to convert abandoned mines into roosts for hibernating bats, creating a human–animal partnership with mutual benefits. "This is a very important part of bat ecology," says French. "We protect [both] the bats and people with gates at the mine entrances. It gives a habitat for bats, and helps give mines a more positive image."

Pollinators may also benefit from the move toward more "natural" gardens in private homes that demand less pesticide use, as well as a 1994 Executive Memorandum issued by President Clinton that recommends the use of regional native plants, which often evolved with their pollinators in a mutually beneficial relationship, and integrated pest management, which features reduced use of pesticides on federal and federally funded properties. And science is beginning to do its part to protect pollinators, as well. In a paper published in the February 1998 issue of *Conservation Biology*, Nabhan, Bitner, Inouye, and 19 other coauthors propose supporting animal pollinator services by promoting alternative pollinators, encouraging crop breeders to consider pollinator attraction in new varieties, preserving pollinator stocks, and researching ways of increasing pollination and creating pollinator habitats in agricultural areas.

Melanoma Vaccines

Researchers are making significant progress in developing innovative treatments for melanoma, a form of malignant skin cancer that is on the rise in the United States, according to the American Cancer Society. Melanoma begins in the melanocytes, the cells that produce the skin pigment called melanin. Researchers believe that exposure to ultraviolet light damages the DNA in these cells, which results in the development of melanoma.

Scientists have been working for years to develop vaccines that treat melanoma by stimulating the immune system to attack cancer cells. The body does not ordinarily attack melanoma cells because such cells are roughly 99% normal, says Philip Livingston, head of the cancer vaccinology laboratory at Memorial Sloan-Kettering Cancer Center in New York City. Researchers have sought to identify the differences that explain why some cells turn cancerous. "We've spent many years in the laboratory trying to define and isolate the genetic elements and the genes that code for what is different on a cancer cell compared to a normal cell that the immune system can recognize," says Steven Rosenberg, chief of surgery at the National Cancer Institute (NCI).

Livingston refers to these characteristic elements of cancer cells, which include proteins and antigens, as "handles." Researchers developing melanoma vaccines replicate these handles and combine them with immune boosters, or substances that the immune system recognizes and attacks. Theoretically, linking the handles with substances known to elicit an immune response will prompt the body to seek out all handles and therewith eliminate the cancer cells. Although the practical application of such vaccines is years away, scientists are making significant advances in the area. "This is a mammoth field," says Paul Chapman, an associate attending physician and head of the melanoma section at Memorial Sloan-Kettering Cancer Center. "There are many vaccines that are being tested, and all are equally promising."

Researchers at Memorial Sloan-Kettering are working on melanoma vaccines that contain one of three replicated chemicals—GM2, GD2, or GD3—that are located on melanoma cells and that have been found to be recognized by the immune system. The vaccines combine the chemicals with QS21, an immune booster from the South American soapbark tree, and KLH, an antigen produced by the mollusk *Megathura crenulata*. Early results show an improvement in survival rates in some patients.

Rosenberg and colleagues at the NCI have chosen to work with cancer cell peptides that the immune system can recognize. They have modified the peptides so they can better bind to the immune cells—cytotoxic T lymphocytes—that attack melanoma cells. The modified peptides are then injected into the body. In a recent study published in the March 1998 issue of *Nature Medicine*, Rosenberg and colleagues reported that, when administered with interleukin-2, a medication that boosts the immune system to help slow the growth of cancer, the vaccine caused an immune system response. They also found that 13 of 31 patients showed at least partial tumor shrinkage in the lung or skin, among other sites.

Another promising vaccine has been developed by Donald Morton and colleagues at the John Wayne Cancer Institute in Santa Monica, California. Morton collected blood, tissue, and serum samples from melanoma patients for many years. Study of these samples enabled him to identify three cancer cell lines that provoke strong immune system responses. Morton is working on a vaccine that uses radiated melanoma cells containing many different handles combined with bacillus Calmette-Guerin, a known immune booster. Morton is currently conducting worldwide clinical trials on the vaccine.

New Source of Fish Fears

In the Snook Nook bait shop in Jensen Beach, Florida, snapshots of anglers holding up their prize catches attest to the rich bounty for which the adjacent Indian River is famous. A few yards from the shop, in a cramped trailer owned by the Florida Department of Environmental Protection (DEP), is another photographic testament to the Indian River's fish. These close-up shots show fish with bloody, open sores reminiscent of those associated with the toxic dinoflagellate *Pfiesteria piscicida*.

The sickened fish in the photos began appearing early this spring on the hooks of anglers fishing around the juncture of Florida's Indian and St. Lucie rivers, a brackish region known as the St. Lucie Estuary. At least 33 species of fish were affected. Although the lesions mimic those associated with the *Pfiesteria* outbreaks that have killed millions of fish in Maryland and North Carolina, the estuary apparently harbors a different culprit; nearly all the sickened fish in the estuary were found alive.

Water samples revealed the presence of *Cryptoperidiniopsis* ("crypto"), one of 10 recognized *Pfiesteria*-like species of microalgae. Karen Steidinger, a senior research scientist, and Jan Landsberg, a research scientist, both of the DEP's Florida Marine Research Institute in St. Petersburg, first identified crypto in 1997 in water samples taken from St. John's River near Jacksonville. Like *Pfiesteria*, crypto is a heterotrophic dinoflagellate that feeds on microalgal prey. Crypto coexists with *Pfiesteria* in Maryland and North Carolina, but appears to live apart from any related species in Florida.

Whether it's causing the ulcers in the St. Lucie fish, though, is not clear. Of the 2,000 known species of dinoflagellates, about 65 have been shown to produce toxins. "There's no evidence [crypto] is toxic," says JoAnn Burkholder, an associate professor of botany and aquatic ecology at North Carolina State University in Raleigh, who in 1991 helped identify *Pfiesteria*. "We don't understand much about toxin pro-